LITERATURE REVIEW ON ANACYCLUS PYRETHRUM
AND PROFILE OF COMPANY JURA IN GERMANY
WHO SUPPLIES THE PYRETHRUM ROOT POWDER

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Middle Ages

Hildegard of Bingen (1098-1179)
Book Physica

Kap. 1.018. DE BERTRAM

Bertram (Piretrum ed.) temperati caloris et aliquantum sicci, et eadem temperies pura est, et bonum viriditatem tenet. Nam sano homini bonus est comestus, quia tabem in eo minuit ac bonum sanguinem in eo auget, et purum intellectum in homine facit. Sed et infirmum, qui iam fere in corpore defecit, ad vires reducit, et in homine nihil indigestum dimittit; sed bonam digestionem illi parat. Et homo, qui multum flegma in capite habet, si eum frequenter comedit, flecma in capite ejus minuit. Sed et saepe comestus pleurisim ab homine depellit, et puros humores in homine parat, et oculos ejus clarificat. Et quocunque modo comedatur, scilicet aut siccus aut in cibo, utilis et bonus est tam infirmo quam sano homini. Nam si homo eum frequenter comedit, ab eo infirmitatem fugat et eum infirmari prohibet. Quod autem comestus in ore humiditatem et salivam educit, hoc ideo est, quia malos humres extrahit, et sanitatem reddit. (PL 1138)

Chapter 18. ABOUT PYRETHRUM-ROOT

1) Pyrethrum-root has a temperate and somewhat dry warmth, and because of this good temperament it is pure (pura est) and has a good powerful action (bonam viriditatem tenet).
2) In a healthy person it is good to be used because it diminishes the waste products in his blood (tabem minuit) and builds good blood (bonam sanguinem auget).
3) It provides him a pure intelligence (purum intellectum in homine facit).
4) For the sick who have already diminished in weight (sed et infirmum qui iam fere in corpore deficit), pyrethrum-root brings them back to strength (ad vires reducit).
5) It lets nothing leave the body unless it is well digested (nihil indigestum dimittit).
6) He who is sick with a lot of mucus in his head (qui multum flegma in capite habet), when pyrethrum-root is used often then this diminishes the mucus in his head (flegma in capite minuit).
7) When frequently used, it cures pleuritis in man, and provides him pure bodyfluids (puros humores in homine parat).
8) It makes his eyes clear (oculos clarificat).
9) However this medical herb is used, dry or cooked with the food, it is always useful and good for the sick and for the healthy.
10) When a person uses pyrethrum-root regularly it banishes sickness (infirmitatem fugat) and prevents him from becoming sick (et infirmari prohibet). It produces saliva in the mouth as a result it extracts the bad fluids (malos humores extrahit) and gives you your health back (sanitatem reddit).

(Hildegard of Bingen Physica PL 1138)
Pyrethrum is described in many important textbooks about medical plants.

**History of the Vegetable Drugs of the U.S.P.**

by John Uri Lloyd, 1911.

Pyrethrum

Pellitory, or Spanish chamomile (*Anacyclus pyrethrum*), is a widely-distributed plant known in different countries under different names. According to Pliny (514) it was the herb used by the Magians under the name *parthenium* against intermittent fevers, and according to Dioscorides (194) it is the plant that, under the name *anthemis*, was used in the same manner. It is mentioned in the "Arabian Nights" (88) under the name *ukhowan*. It is found throughout European Turkey, and according to Forskal southward to the mountains of Yemen, where it is called *moeniat*. According to De Candolle (122) its introduction into Britain was perhaps before the coming of the Romans. The European colonists carried it, according to Josselyn (345) to Northeast America before 1669, where it is to be found both under cultivation and, having escaped therefrom, as a wild plant. Once a popular remedy in agues, its use is now practically discontinued, even in domestic medicine. Physicians as a rule neglect it, but it is employed by them in a few exceptional instances.
Dodoens 1554

Van Bertram.

A


B

Bertram is een cyrt op watte bladeren gelijck Doncel. Sijn bloumen zijn gesfarneert gelijck als sterren, ende wist gelijck als de bloemen van Camille, want sijn ap- pelken is binnen geel, ende ringen soms me met witte bladeren verhhert. Na dat die witte bladeren asgual len sijn so compt dat saet voort. Die woztel is een buym bieck, en land, end sijn scherf van smake.

Plaetse sijnder wasfinghe.

Bertram en wat niet ouer al sijns selve/maar men moeust van saet in- behouden plante.

C

De wootel van Bertram teen die tayt humeten en flustrien wonen hoofs de als men die inden month houdt en de krount. In sijn geslinden ende inden mondgethehouden/so dit aan den bieckwys daermede gewassen, dat enemt wacht de pinnen ende hangen in omende van couden vloeten. Si maect den mensch sweeterende, als sijn olie ghesoden oft ghetoverckt is, ende dat kan den mensch daermende sintere oft saltate. In deze maner is den Bertram saet goet ghev ееr tot vercouben ende lamme liden. Si is oock goet tegenh de buysteringe van de couris/alsmen dat gantsche liss daermede saltate. Iff dat iemand reet- nich lidt het dat sijn geuwelen verloot heeft, die sul hem sinteer met olie daer Bertram in gesdoben is, so sal dat lidt wederom tot hem felien kommen.

Van
Culpepper 1652

Pellitory of Spain

Common Pellitory of Spain, if it be planted in our gardens, will prosper very well; yet there is one sort growing ordinarily here wild, which I esteem to be little inferior to the other, if at all. I shall not deny you the description of them both.

**Descript** : Common Pellitory is a very common plant, and will not be kept in our gardens without diligent looking to. The root goes down right into the ground bearing leaves, being long and finely cut upon the stalk, lying on the ground, much larger than the leaves of the Camomile are. At the top it bears one single large flower at a place, having a border of many leaves, white on the upper side, and reddish underneath, with a yellow thrum in the middle, not standing so close as that of Camomile.

The other common Pellitory which grows here, hath a root of a sharp biting taste, scarcely discernible by the taste from that before described, from whence arise divers brittle stalks, a yard high and more, with narrow leaves finely dented about the edges, standing one above another up to the tops. The flowers are many and white, standing in tufts like those of Yarrow, with a small yellowish thrum in the middle. The seed is very small.

**Place** : The last grows in fields by the hedge sides and paths, almost everywhere.

**Time** : It flowers at the latter end of June and July.

*Government and virtues* : It is under the government of Mercury, and I am persuaded it is one of the best purgers of the brain that grows. An ounce of the juice taken in a draught of Muskadel an hour before the fit of the ague comes, it will assuredly drive away the ague at the second or third time taken at the farthest. Either the herb or root dried and chewed in the mouth, purges the brain of phlegmatic humours; whereby not only easing pains in the head and teeth, but also hinders the distilling of the brain upon the lungs and eyes, whereby preventing coughs, phthisicks and consumption, the apoplexy and falling sickness. It is an excellently approved remedy in the lethargy. The powder of the herb or root being sniffed up the nostrils, procures sneezing, and eases the head-ache; being made into an ointment with hog's grease, it takes away black and blue spots occasioned by blows or falls, and helps both the gout and sciatica.
555. Pyrethrum.—Pyrethrum

Pellitory. Roman Pellitory

The root of *Anacyclus pyrethrum* (Linne) De Candolle. Preserve in tightly closed containers, adding a few drops of chloroform or carbon tetrachloride, to prevent attack by insects.


SOURCE.—Mediterranean Basin, coming solely from Algeria, thence to Mediterranean points.

DESCRIPTION OF DRUG.—A *hard, compact*, somewhat fusiform root, about the size of the little finger, with sometimes leaf-remnants at the top, and beset with few or no hair-like rootlets; externally brownish, deeply fissured longitudinally. It breaks with a short fracture, showing a rather thick bark adhering closely to the pale brown wood, from which it is separated by a narrow cambium line. This woody column is traversed by broad, distinct medullary rays, and contains as does also the bark, large scattered resin ducts. Odor very slight, taste slight at first, but afterward persistently acrid, leaving a singular tingling sensation in the mouth and throat, and exciting a remarkable flow of saliva.

555a. *Pyrethrum Germanicum*, from *Anacyclus officinarum* Hayne (more), is of a grayish color, about half as thick as above, tapering to filiform at the lower end; has long been cultivated near Magdeburg and in Saxony. It resembles the above in foliage and flowers.

CONSTITUENTS.—A very acrid resinous substance, two acrid oils—pyrethrines, extracted by ether (crystalline, bitter, burning taste), which under action of alcoholic KOH decomposes into piperidine. Most of the parenchymatous cells are loaded with inulin, which forms about 35 per cent. of the root. Ash, not more than 5 per cent.

ACTION AND USES.—Used almost exclusively as a sialagogue in headache, neuralgic and rheumatic affections of the face, toothache, etc., or as a local stimulant in palsy of the tongue or throat, or relaxation of the uvula. Dose when chewed: 30 to 60 gr. (2 to 4 Gm.).
Pyrethrum (U. S. P.)—Pyrethrum.

The root of Anacyclus Pyrethrum (Linné), De Candolle (Anthemis Pyrethrum, Willdenow; Matricaria Pyrethrum, Baillon).

Nat. Ord.—Compositae.

COMMON NAMES: Pellitory, Pellitory root, Pellitory of Spain, Spanish chamomile.

ILLUSTRATION: Bentley and Trimen, Med. Plants, 151.

Botanical Source, History, and Description.—This is the Anthemis Pyrethrum of Willdenow, the name of which has been changed by De Candolle, and the plant placed in a new genus on account of a difference in the structure of its seeds. The stems are numerous, procumbent, somewhat branched, and pubescent. The radical leaves are spreading, petiolated, smoothish, and pinnately divided; the segments much-cleft into linear, subulate lobes; and the cauline leaves sessile. Branches 1-headed. Receptacle convex, with oblong-obovate, obtuse paleae; ray sterile, ligulate, and white; of the disk, fertile, with 5 callous teeth, and yellow (L.). Pellitory of Spain, or Spanish chamomile, inhabits Barbary, Arabia, Syria, etc. The root is the official part, and is officially described as "from 5 to 10 Cm. (2 to 4 inches) long, and 1 to 2 Cm. (1/4 to 3/5 inch) thick, somewhat fusiform, nearly simple, annulate above, wrinkled below; externally dark grayish-brown; internally brownish-white; fracture short; bark rather thick, containing 2 circles of resin cells, and surrounding the slender wood-bundles and medullary rays, the latter having about 4 circles of shining resin-cells; inodorous, pungent, and very acrid"—(U. S. P.). The root, when chewed, produces a peculiar sensation of pricking in the lips and tongue, and a glow of heat, with an increase of the salivary discharge. It maybe readily distinguished from False pellitory root, identified by Mr. E. M. Holmes (Amer. Jour. Pharm., 1892, p. 90), as derived from Corrigiola telephiifolia (more), a Morocco plant, chiefly by the appearance of its cross-section (see illustration, loc. cit.).

Chemical Composition.—In 1835, Koene found it to contain a brown acrid resin, insoluble in caustic potash; an acrid, brown fixed oil, soluble in caustic potash; a yellow, acrid oil, also soluble in this solvent; a trace of tannic acid, gum, inulin, various salts, and lignin. Alcohol or ether dissolves its active principle. This is claimed by Buchheim (1876) to be an alkaloid, pyrethrine, a body splitting into piperidine and an acid, resembling piperic acid, called pyrethric acid, when treated with alcoholic solution of caustic potash (see Piperinum). The pyrethrin of Thompson (Pharm. Jour. Trans., Vol. XVII, 1887, p. 567) is an ether-extract, composed of acrid fat and resin. This author found the cortical portion of the root to contain 5 per cent of pyrethrin. Volatile oil is likewise present. Dunstan and Garnett (Jahresb. der Pharm., 1895, p. 64) isolated from the resin crystallizable pellitorin, insoluble in water, diluted acids, and alkalis, soluble in alcohol. It resembles pipérovatín (C\textsubscript{16}H\textsubscript{21}NO\textsubscript{2}), the non-basic, active principle isolated by the same authors from the resin obtained from the leaves of Piper ovatum. Both are pyridine derivatives.

Action, Medical Uses, and Dosage.—It is an energetic local irritant and sialagogue, and acts as a rubefacient when applied externally. Its ethereal tincture relieves toothache. The root chewed has been found useful in some rheumatic and neuralgic affections of the head and face, and in palsy of the tongue. The decoction has been used as a gargle in relaxation of the uvula. Severe acronarcotic symptoms, with inflammation of the alimentary tract and bloody stools, were produced in a young child by less than a drachm of the tincture. The dose is from 30 to 60 grains as a masticatory. Oil of pellitory is made by evaporating the ethereal tincture; it is an excellent remedy for toothache.
Related Species and Drugs.—*Anacyclus officinarum*, Hayne (more), German pellitory. A cultivated plant of Germany. By some considered an annual form of *Anacyclus Pyrethrum*. Its action is the same as, but weaker than, the latter.

**Herb Information**

<table>
<thead>
<tr>
<th>Name: Pellitory</th>
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<tbody>
<tr>
<td>Biological Name: Anacyclus pyrethrum, Pyrethrum radix</td>
</tr>
<tr>
<td>Other Names: Pellitory, Akarakara, Akarkara, Aquarqarha, Akkirakaram, Akkalkara, Akkarakaram, Pellitory of Spain, Pyrethre, Pyrethrum, Roman Pellitory, Spanish Camomile</td>
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<tr>
<td>Parts Used: Root</td>
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<td>Active Ingredients:</td>
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This herb contains an essential volatile oil and an alkaloid, pellitorin or pyrethrin. It has alkamides, lignane (including sesamine), inulin (fructosan) and tannins. Alkamides includes deca-2,4-dien acid-isobutylamide, anacycline, and dehydroanacycline.

It is believed that application of this herb to the skin stimulates the nerve ends that may result in redness, and irritation accompanied by a hot, burning sensation.

**Remedies For:**

Root of this herb is a valuable sialogogue. It is often used as a tonic to the nervous system. It is powerfully irritant. It is also used for rheumatic conditions, and to aid in digestion. Also useful for toothaches (use as a gargle). It is also used as an insecticide. Other applications include treatment for epilepsy, paralysis, hemiplegia, and for sore throat and tonsils. Some herbalists suggest that this herb may be useful for diabetes.

**Description:**

This herb is found in North Africa, in the Mediterranean, Himalayas, North India and Arabian countries.

**Dosage:**

Preparation: powder, pills, paste, tonic.

1. **Powder:** Blow [Pellitory combination herbal powder](#) into the nose for Epilepsy.

2. **Pill:** 1 to 5 grs. of [Pellitory Combination Pill](#) is given to children for irritability of temper,
wakefulness, painful dentition, diarrhea, colic and vomiting.

3. **Churna:** Take 6 grains of Akara Karabhadi Churna for impotence and chronic bowel complaints.

4. Boil 35 grs. in water. It is given as drink in diabetes.

**Safety:** No health hazards or side effects are reported if this herb is used under the supervision of a qualified practitioner.

Overdoses may result in irritation, due to the mucus-membrane-stimulating characteristics of the alkamides found in this herb.

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**Immunostimulating activity of the hot water-soluble polysaccharide extracts of Anacyclus pyrethrum, Alpinia galanga and Citrullus colocynthis.**

**Bendjeddou D, Lalaoui K, Satta D.**

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Hot water polysaccharide extracts of *Anacyclus pyrethrum* (L.) Link. (family Compositae) *Citrullus colocynthis* (L.) Schrad. (family Cucurbitaceae) and *Alpinia galanga* (L.) Willd. (family Zingiberaceae) were tested for their immunostimulating activity in mice. The fractions from *Anacyclus pyrethrum* and *Alpinia galanga* showed a marked stimulating effect on the reticulo-endothelial system (RES) and increased the number of peritoneal exudate cells (PEC), and spleen cells of mice. In this case, the optimum doses were 50 and 25 mg/kg for the two fractions, respectively. On the other hand, the polysaccharide extracts of both *Anacyclus pyrethrum* and *Alpinia galanga* markedly enhanced the proliferation of the murine spleen cells in vitro using two tests (in vitro and in vivo effect). The results of the in vivo effect at a doses of 50 and 25 mg/kg, showed a stimulation index better than obtained with the in vitro effect at 50 and 25 microg/ml for *Anacyclus pyrethrum* and *Alpinia galanga*, respectively. While the extract of *Citrullus colocynthis* showed much weaker and variable immunostimulating activity.

PMID: 12963136 [PubMed - indexed for MEDLINE]
Inhibition of tobacco-induced mutagenesis by eugenol and plant extracts.

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Inhibitory effects of eugenol, a compound present in many spices such as cloves, cardamom etc. and the extracts of Anacyclus pyrethrum and Spilanthes calva which are traditionally used in India during the preparation of chewable tobacco, on tobacco-induced mutagenesis were evaluated using Ames Salmonella/microsome assay. Eugenol significantly inhibited (P < 0.001) tobacco-induced mutagenicity at concentrations of 0.5 and 1 mg/plate. Anacyclus pyrethrum extract (1 mg/plate) produced 74.33% inhibition while the extract of Spilanthes calva at 2 mg/plate inhibited tobacco-induced mutagenesis by 86.4%. Eugenol and the plant extracts also inhibited the nitrosation of methylurea in a dose-dependent manner.

PMID: 7753104 [PubMed - indexed for MEDLINE]

Pellitory

Botanical: Anacyclus pyrethrum (D.C.)
Family: N.O. Compositae

- Description
- Cultivation
- Constituents
- Medicinal Action and Uses
- Dosages
- Other Species

---Part Used---Root.
---Habitat---Algeria. Cultivated in Mediterranean countries.

---Description---This perennial plant, in habit and appearance like the chamomile, has stems that lie on the ground for part of their length, before rising erect. Each bears one large flower, the disk being yellow and the rays white, tinged with purple beneath. The leaves are smooth, alternate, and pinnate, with deeply-cut segments.

The root is almost cylindrical, very slightly twisted and tapering and often crowned with a tuft of grey hairs. Externally it is brown and wrinkled, with bright black spots. The fracture is short, and the transverse section, magnified, presents a beautiful radiate structure and many oleoresin glands. The taste is pungent and odour slight.
---Cultivation---Planting may be done in autumn, but the best time is about the end of April. Any ordinary good soil is suitable, but better results are obtained when it is well-drained, and of a stiff loamy character, enriched with good manure. Propagation is done in three ways, by seed, by division of roots and by cuttings. If grown by seed, sow in February or March, thin out to 2 to 3 inches between the plants, and plant out early in June to permanent quarters, allowing a foot or more between the plants and 2 feet between the rows, selecting, if possible, a showery day for the operation. The seedlings will quickly establish themselves. Weeding should be done by hand, the plants when first put out being small, might be injured by hoeing. To propagate by division, lift the plants in March, or whenever the roots are in an active condition, and with a sharp spade, divide them into three or five fairly large pieces. Cuttings should be made from the young shoots that start from the base of the plant, and should be taken with a heel of the old plant attached, which will greatly assist their rooting. They may be inserted at any time from October to May. The foliage should be shortened to about 3 inches, when the cuttings will be ready for insertion in a bed of light, sandy soil. Plant very firmly, surface the bed with sand, and water in well. Shade is necessary while the cuttings are rooting.

---Constituents---Analysis has shown a brown, resinous, acrid substance, insoluble in potassium hydroxide and probably containing pelletonin, two oils soluble in potassium hydroxide - one dark brown and acrid, the other yellow - tannin, gum, potassium sulphate and carbonate, potassium chloride, calcium phosphate and carbonate, silica, alumina, lignin, etc.

An alkaloid, Pyrethrine, yielding pyrethric acid, is stated to be the active principle.

---Medicinal Action and Uses---Pellitory root is widely used because of its pungent efficacy in relieving toothache and in promoting a free flow of saliva. The British Pharmacopoeia directs that it be used as a masticatory, and in the form of lozenges for its reflex action on the salivary glands in dryness of the mouth and throat. The tincture made from the dried root may be applied to relieve the aching of a decayed tooth, applied on cotton wool, or rubbed on the gums, and for this purpose may with advantage be mixed with camphorated chloroform. It forms an addition to many dentifrices.

A gargle of Pellitory infusion is prescribed for relaxed uvula and for partial paralysis of the tongue and lips. To make a gargle, two or three teaspoonsful of Pellitory should be mixed with a pint of cold water and sweetened with honey if desired. Patients seeking relief from rheumatic or neuralgic affections of the head and face, or for palsy of the tongue, have been advised to chew the root daily for several months.

Being a rubefacient and local irritant, when sliced and applied to the skin, it induces heat, tingling and redness.

The powdered root forms a good snuff to cure chronic catarrh of the head and nostrils and to clear the brain, by exciting a free flow of nasal mucous and tears.

Culpepper tells us that Pellitory 'is one of the best purges of the brain that grows' and is not only 'good for ague and the falling sickness' (epilepsy) but is 'an excellent approved remedy in lethargy.' After stating that 'the powder of the herb or root snuffed up the nostrils procureth sneezing and easeth the headache,' he goes on to say that 'being made into an ointment with hog's lard it taketh away black and blue spots occasioned by blows or falls, and helpeth both the gout and sciatica,' uses which are now obsolete.
In the thirteenth century we read in old records that Pellitory of Spain was 'a proved remedy for the toothache' with the Welsh physicians. It was familiar to the Arabian writers on medicine and is still a favourite remedy in the East, having long been an article of export from Algeria and Spain by way of Egypt to India.

In the East Indies the infusion is used as a cordial.


---Other Species---
Anacyclus officinarum is indigenous to Africa, cultivated in Germany, and formerly official in the German Pharmacopoeia. The roots are smaller and very pungent. It is also known as A. pyrethrum, Pyrethrum germanicum and German Pellitory.
PYRETHRI RADIX, B.P.
PYRETHRUM ROOT.

Pyrethrum, or pellitory, root (Pyrethrum, U.S.P.), is obtained from *Anacyclus Pyrethrum*, DC. (N.O. Compositae), a small plant indigenous to Algeria, being collected in the autumn and dried. The root is simple, from 5 to 10 centimetres long, and about 12 millimetres in thickness, tapering towards the tip, and often also towards the crown, where a tuft of greyish hairs can usually be seen. The external surface is brown, and longitudinally furrowed. The root is tough, but breaks with a short fracture, the fractured surface exhibiting a conspicuously radiate structure, narrow yellowish wedges of wood alternating with whitish medullary rays. Numerous yellow or brown oil glands occur both in the cortex and medullary, rays. The root yields from 4 to 6 per cent. of ash. The odour is characteristic; the taste, pungent, producing a copious flow of saliva. The root of *Corrigiola telephiifolia*, Pour. (N.O. Illecebraceae), is not infrequently found in commercial pellitory root, occasionally in considerable quantity. The root resembles pellitory very closely, but may be distinguished by the warty protuberances with which it is crowned, and by the section which exhibits three or four concentric circles, that of pellitory being radiate. It is devoid of the pungent taste of pellitory.

**Constituents.**—The chief constituent is a colourless, crystalline alkaloid, pyrethrine (also called pellitorine), which is apparently allied to piperine; it possesses an intensely pungent taste, and produces the sialagogue effect. Pyrethrum root also contains about 50 per cent. of inulin, and traces of volatile oil.

**Action and Uses.**—Pyrethrum root is used as a masticatory, and in the form of lozenge for its reflex action on the salivary glands in dryness of the mouth and throat. The tincture is applied on cotton wool, or rubbed along the gums in toothache, and for this purpose may with advantage be mixed with camphorated chloroform.

*Dose.*—1 to 2 grammes (15 to 30 grains).
Pyrethri Radix

**Synonyms:** Pyrethri romani radix, Radix Pyrethri, Radix Pyrethri romani

**Other names:** German: Bertramwurzel, Franzosenwurzel, Römische Bertramwurzel, Speichelwurzel, Zahnwurzel; English: pellitory root, pyrethrum root; French: racine de pyrèthre d’Afrique; Italian: Piretro; Portugese: Pyrethro da Africa, parietaria de Espanha; Spanish: raiz de pelitre, pyrethro, salivaría.

**Monograph collections:** Radix Pyrethri *EB* 6, Pyrethri radix *Ind* PC 53, Racine de Pyrèthre d’Afrique *CF* 37, Pyrethro da Africa *Brazil* 1, *Portug* 35.

**ATC:** [A01AD] Other agents for local treatment.

**Definition of the herbal drug:** The dried root *EB* 6.

**Source plant:** *Anacyclus pyrethrum* (L.) *LINK*.

**Collection:** Dried roots, collected in autumn from wild or cultivated stocks in North Africa [12].

**Commercial forms:** Pyrethri radix *EB* 6.

**Whole herbal drug:** 6 to 14 cm long, 0.5 to 3 cm thick, cylindrical to fusiform, grey-brown root with deep longitudinal fissures; the upper part of the root bears a crest of whitish leaf residues. The fracture is hard and brittle *EB* 6 [12].

**Cut herbal drug:** *Odour:* Slightly aromatic. *Taste:* Sharp, burning; the root induces a strong flow of saliva when chewed *EB* 6 [4]. *Macroscopic description:* The cut herbal drug is characterized by fragments of root, which are grey-brown on the outside, with deep longitudinal fissures, and pale yellow on the inside, with a thin, brown cortex interspersed with secretary ducts and a xylem with distinct radial banding due to the yellow xylem rays *EB* 6 [4].

*Hand lens:* In cross-section, the root shows a multilayered periderm, in which layers of stone cells are embedded (stone cork). The cortex contains several rings of excretory sacs and radial bundles of sieve tubes and medullary rays. The xylem shows distinct xylem rays with radial vessels. The medullary rays again contain excretory sacs; medulla is absent. The parenchyma contains granules of inulin [12].
Microscopy: In cross-section, the herbal drug is variably circular in outline and is delineated by a few layers of tangentially flattened, empty cork cells with thick suberin layers; some stone cells are also found in the outer cortex. The periderm is developed exogenously. The cork cambium on the inside generates a few parenchymal cells which form the secondary cortex. As a result of the secondary growth, a large part of the stelar region is taken up by secondary xylem rays in individual bundles, delineated to the outside by a few secondary phloem layers. The secondary xylem is interspersed with broad parenchymal rays, medulla is almost completely absent. In older roots, there may be 25 to 30 bundles of secondary xylem. The vessels are mostly located in tangential bands, with the vessels connecting small clusters of fibres. In cross-section, the rootlets show a central tetrarch to pentarch primary xylem, with primary phloem between the xylem rays. Schizogenic intracellular spaces form the three-dimensional structure, with resin ducts each bordered by 15 to 20 epithelial cells. Crystals of varying shapes and sizes are common in the parenchymal cells of the phloem, xylem and rays. After maceration, the thin root cortex mostly comprises stone cells, fibres, vessels, and sieve tubes, as well as parenchyma and crystals [16].

Pyrethri radix: a pieces of root, b cross-section through root, c cross-section through root with peridermal cells, d cross-section through young root, e longitudinal section through secondary xylem, f longitudinal section through secondary phloem, g-i root cross-section with xylem cells, g inner xylem, h middle xylem, i outer xylem, k cross-section of root with sieve cell and companion cells, l calcium oxalate crystals, m-t macerated root cells, m stone cell, n parenchyma, o fibres, p macrosclereid, r,s vascular element, t sieve tube [16].

In powder mixtures, Anacyclus pyrethrum can be microscopically identified and quantified on the basis of groups of rectangular to polygonal stone cells with elongated tubular and roundish pits [19].

Powdered herbal drug: The powdered herbal drug is light brown with individual, yellow, strongly pitted stone cells approx. 80 µm in size, multilayered fragments of periderm with
rows of stone cells, fragments with vessels showing reticular pitting and excretory ducts as well as granules of inulin EB 6 [4].

**Adulteration/misidentification:** With *Corrigiola telephiifolia*, Caryophyllaceae; the roots of *Anacyclus x officinarum* (= Pyrethri germanici radix) also count as adulteration [4, 12].

**Low grade:** Thinner roots only about 0.5 cm across with thick cortex and no stone cells in the periderm should not be used EB 6 [4].

**Constituents:** *Alkyl amides.* A crystalline constituent of the roots of *Anacyclus pyrethrum* was originally called “pyrethrin” [49] – a name which is now reserved for the active constituents of Pyrethri flos (see Tanacetum cinerariifolium, see companion work, volume 3) – and later called “pellitorine” [20] and identified as a mixture of isobutylamides of unsaturated C\(_{10}\), C\(_{12}\) and C\(_{14}\) acids with decadiene isobutylamide as the principal constituent [21-23]. It is now known that the alkyl amide fraction of the roots of *Anacyclus pyrethrum* is made up of the following isobutylamides and tyramine amides: (\(E,E\))-2,4-tetradecadiene-8,10-diynoic acid isobutylamide (= anacyclin), 2\(E,4E\)-dodecadienoic acid isobutylamide, (\(E,E\))-\(N-(4\text{-hydroxyphenethyl})\)-2,4-decadienamide, (\(E,E\))-\(N-(4\text{-hydroxyphenethyl})\)-2,4-dodecadienamide, (\(E,E\))-\(N-(4\text{-hydroxyphenethyl})\)-2,4-tetradecadienamide, \(N\text{-methyl-}\)(\(E,E\))-decadienic acid isobutylamide (= pellitorine) 0.14% relative to dry weight [25], (\(E,E\))-\(N-(2\text{-phenethyl})\)-2,4-undecadiene-8,10-diynamide and 2,4-tetradecadienoic acid isobutylamide [21, 24-39].

**Lignans.** (+)-Sesamine is present [24].

**Inorganic compounds.** The dried root contains Mn (24.7 ± 1.51 µg/g), Zn (22.01 ± 1.3 µg/g), Cu (9.15 ± 0.7 µg/g), Na (20.13 ± 4.09 mg/g) and K (12.13 ± 0.2 mg/g) [41].

**Other compounds.** Approx. 30 to 55% inulin; tannins; resin; essential oil (traces) [40].

<table>
<thead>
<tr>
<th>Pellitorine</th>
<th>2,4-Dodecadienic acid isobutylamide</th>
<th>2,4-Tetradecadienoic acid isobutylamide</th>
</tr>
</thead>
<tbody>
<tr>
<td>N-(4-Hydroxyphenethyl)-2,4-decadienamide</td>
<td>2,4-dodecadienamide</td>
<td>N-(4-Hydroxyphenethyl)-2,4-decadienamide</td>
</tr>
</tbody>
</table>

[Illegible]  [Illegible]  [Illegible]
Anacyclin

$N$-Methylanacyclin

$N$-Methyl-$N$-(2-methylpropyl)-2,8-decadiene-4,6-diynamide

$N$-Methyl-$N$-(2-methylpropyl)-2-decane-4,6-diynamide

$N$-(2-Phenethyl)-2,4-undecadiene-8,10-diynamide

Purity: – Alcoholic extract: $\geq 14\%$ Ind PC 53

– Ash: $\leq 5\%$ Brazil 1, Portug 35; $\leq 6\%$ EB 6; $\leq 7\%$ Ind PC 53

– Foreign matter/admixtures: $\leq 2\%$ Ind PC 53

Storage: In tightly sealed containers. Because of the irritant action on the mucous membranes, the face must be protected from dust when powdering the root [4].

Formulations: For the isolation of pellitorine as an insecticidal amide see ref. [4].

Effects: Effects on prostaglandin metabolism. In vitro at a concentration of 50 µg/ml, the alkyl amide deca-2E,4E-dienoic acid tyramide from the roots of Anacyclus pyrethrum has a 25% inhibitory effect on microsomal cyclooxygenase (sheep seminal fluid) and a 34% inhibitory effect on 5-lipoxygenase (pig leucocytes) [42].

Antimicrobial effect. The residue from the extraction of the herbal drug with 70% EtOH (herbal drug:extract = 1:2), dissolved in isopropanol, has a weak antimicrobial effect according to the filter disc diffusion method. The inhibition zone for Bacillus cereus is 20 mm, for Staphylococcus albus 35 mm, and for Staphylococcus aureus 32 mm [43].

Local irritation. Chewing pyrethrum root provokes a persistent burning and partial desensitization of the tongue and nearby mucous membranes together with a pronounced increase in salivary flow [32]. The effect is ascribed primarily to the pellitorine, less so to the
anacyclin. Pellitorine is a rubefacient skin irritant and sialagogue; it causes intense burning and local anaesthesia of mucous membranes [16, 35]. Alkyl amides are characterized by a hot taste, a local anaesthetic effect on mucous membranes and the promotion of salivation [32, 38].

**Local anaesthetic effect.** A local anaesthetic effect of *Anacyclus pyrethrum* is said to have been demonstrated in animal studies. No details are available [53]. In a double-blind study in 200 dentistry patients, the local anaesthetic effect of an alcoholic extract of the roots (2%, freshly dissolved in sterile distilled water) was compared with that of 2% Xylocaine hydrochloride solution. The maximum dose of the extract was 0.2 ml, corresponding to 4 mg of the herbal drug. The study was limited to the extraction of mandibular molars. *Anacyclus pyrethrum* brought about a pterygomandibular block with infiltration of the long buccal nerve. A good depth of anaesthesia was observed in 90 out of 100 patients (Xylocaine: 80 out of 100 patients); the anaesthetic effects of the two substances are similar, but last longer in the case of *Anacyclus pyrethrum* [52].

**Insecticidal and molluscicidal effect.** The alkyl amides from *Anacyclus pyrethrum* have insecticidal and molluscicidal effects [38]. The insecticidal effect is said to parallel the sialagogic effect [21]. The insecticidal effect of pellitorine is particularly pronounced [27, 36, 39, 48]. A solution of pellitorine in Deobase (= purified kerosene, concentration not given) as a spray for house flies (*Musca domestica* L.) is said to show the same paralysing effect and slightly more than half the lethal effect as the same concentration of pyrethrins [25].

Pellitorine is also lethal to adult yellow mealworms (*Tenebrio molitor*) [48]. A 3.1% solution of pellitorine in acetone topically applied to mealworms as standardized drops under defined conditions causes immobilization of 45% after 24 h [21]. The toxicity of alkyl amides appears to be dependent on the number of double bonds. Anacyclin, as a 3% solution in acetone, caused only 10% mortality in *Tenebrio molitor* [21, 24]. Catalytic partial hydrogenation of the two acetylene bonds greatly increased the effect. The same concentration of tetrahydroanacyclin caused the immobilization of 100% [21].

**Dosage and nature of use:** The root is either chewed or used as an infusion for rinsing or gargling [4, 12]. Dose: 0.1 to 0.25 g of the root or 10 to 30 drops of the tincture not more than twice daily [12]. Mean content of the mouthwash (decoction) 1% *EB 6*. 

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**Undesirable effects:** Therapeutic overdoses can lead to nausea, vomiting, diarrhoea and severe headaches [12].

**Traditional uses and other indications:** In toothache, mouth diseases, dry mouth and paralysis of the tongue. Internally as a tonic in weak digestion, as an aphrodisiac, in gout, sciatica, epilepsy and lethargy, constipation, malaria, chronic rheumatism, worms; as a sternutatory in chronic head and nasal catarrh [1, 4, 12, 38]. For the preparation of “pyrethrum vinegar” as a mouthwash for toothache and in various recipes such as Tinctura odontalgica hamburgensis (Tinctura Spilanthis comp.) [14]. In Myanmar (Burma) Pyrethri radix, together with Cardamomi fructus, Liquiritiae radix and Caryophylli flos, forms part of the traditional medicinal formulation laymyoshitsei hsay [19]. In India, as a gargle for toothache and as an infusion for rheumatic complaints [44, 45]; as a nerve tonic in facial paralysis. Paralysis, hemiplegia, epilepsy and cholera, and also in rheumatism, sciatica and oedema [16]. Local application to the forehead is said to cure headaches [46].

The efficacy of the herbal drug in the indications cited has not been confirmed.

**Other indications:** As a constituent of oral hygiene products [1].

**Acute toxicity:** *Human.* Pellitorine is said to cause tetanus-like convulsions. No further details are available [47].

**Mutagenicity:** At a concentration of 1 mg/plate, the extract of the roots of *Anacyclus pyrethrum* causes a 74% reduction in tobacco-induced mutations in the Ames Salmonella microsome test (Salmonella typhimurium strain TA 102 and S9 fraction) [51].

**Reproduction toxicity:** The seeds of *Anacyclus pyrethrum* caused miscarriages in pregnant albino rats when given orally for 10 days after copulation at a daily dose of 175 mg/kg BW. The antifertile activity was 15% and skeletal and visceral malformations were common in the fetuses [55].

**Toxicological data:** *LD values.* Root extract: LD$_{50}$ (mouse) 750 mg/kg i.p. [50].
Isolation and Structure of an N-isoButyldienediynamide from Pellitory (*Anacyclus pyrethrum* DC.)

L. CROMBIE


THE roots of the North African plant *Anacyclus pyrethrum* DC. (pellitory) have been used in medicine since the time of Dioscorides, and mention of the drug is made in the B.P.C. 1934 (*Pyrethri radix*). It induces copious salivation when chewed and gives rise to an intense burning taste. In a recent investigation it has been found\(^1\) that the crystalline sialogogue isolated by Gulland and Hopton\(^2\) from this material, and named pellitorine (melting point 72°), is in fact a mixture of iso-butylamides\(^3,4\) of the general type \(\text{R.CH} \equiv \text{CH.CH} = \text{CH.CO.NHCH}_2 \text{CH(CH}_3)_2\). (1) Hydrogenation and acidic hydrolysis yield a mixture of decanoic, dodecanoic and tetradecanoic acids which can be separated by reversed-phase partition chromatography. Its nature will be discussed more fully elsewhere. During the isolation of pellitorine, a new crystalline substance of melting point 121° has been obtained, which crystallizes from chloroform–petrol in white needles. Unlike pellitorine, it is but sparingly soluble in petrol, has no sialogogue effect and only low insecticidal activity towards the grain insect *Tenebrio molitor* L.

Antiinflammatory Activity of Some Extracts from Plants used in the Traditional Medicine of North-African Countries

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KEYWORDS
antiinflammatory activity • plant extracts • carrageenan oedema • arachidonic acid oedema

ABSTRACT
Aqueous, ethanol and chloroform extracts from five plants were administered either topically (oedema induced by arachidonic acid in mouse ear) or i.p. (subplantar oedema induced by carrageenan in rats). Our results show that Anacyclus pyrethrum, Armeria alliacea, Asphodelus ramosus, Capparis spinosa and Rhaponticum acaule possess antiinflammatory activity, since at least one extract of each plant was active in one of the experimental models. The three extracts from Anacyclus pyrethrum showed significant activity in both experimental models, but the highest antiinflammatory activity was exhibited by the polar extracts of Armeria alliacea. The ethanol extract of the latter produced 100% inhibition of the inflammation induced by carrageenan and this inhibition was highly significant (p<0.001) with reference to values found in both active (indomethacin 3 mg/kg) and vehicle administered control groups.

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DIGITAL OBJECT IDENTIFIER (DOI)
10.1002/(SICI)1099-1573(199608)10:5<421::AID-PTR851>3.0.CO;2-U  About DOI
peleter - Pellitory (*Anacyclus pyrethrum*). An herb with a hot, spicy flavor. Also called Spanish Chamomile and Mount Atlas daisy.

pellydore - Pellitory (*Anacyclus pyrethrum*). An herb with a hot, spicy flavor. Also called Spanish Chamomile and Mount Atlas daisy.
INFORMATION FROM COMPANY JURA

Pyrethrum root (Anacyclus pyrethrum) is simply a spice or herb as you know, like thym or peppermint. We by the dried roots in Morocco and let it make to powder.

We do quality control by Thin Layer Chromatography. Then we just fill the powder in smaller packages, so we are not a "manufacturer", a supplier at best.

2) Short Company profile :

Name : Jura Pharmazeutische Fabrik Gollwitzer KG
Address : Nestgasse 2, 78464 Konstanz, Germany
tel. ++49 7531 31005
fax.++49 7531 33403

Number of employees : 20
Product profile : Food, herbs and spices, dietary products, pharmaceutical products based on plant origin, homeopathics

3) Company registration : "Herstellungserlaubnis zur Herstellung von Humanarzneimitteln, ausgestellt vom Regierungspräsidium Tübingen am 30.06.2006". That means kind of "permission on the production of drugs for human beings, issued by our local drug authority on June 30, 2006, the "Regierungspräsidium Tübingen"

Best regards
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4) Every two years we organise together with Dr. Wighard Strehlow and the „Förderkreis Hildegard von Bingen“ an International Congres in Konstanz. In 2006 two Zambians were invited to give testimony on their experience with pyrethrum root powder. Also in 2008 they are invited. The two people are Mr Boston Musonda, project-coordinator of Bertram Project zambia Foundation and the general secretary Mr. Gershom Kapalaula.

5) Web-site: www.hildegard.de
INVITATION LETTER FROM DR. WIGHARD STREHLOW

Dear Mr. Boston Musonda and Dear Mr. Gershom Kapalaula,

As the president of the Foerderkreis - Hildegard von Bingen I hereby invite you both to the International Hildegard Congress to be held in Konstanz, S. Germany, from the 4th to the 7th of May, 2006. We are looking forward to meeting you and hearing all the newest about Bertram in Sambia.

I wish you a good trip and will be very happy to see you in May.

Sincerely,
Dr. Wighard Strehlow

Quality control by company Jura.

Above: Dr. Jürgen Gollwitzer, Mr. Gershom Kapalaula, general secretary BPZF, Mr. Boston Musonda, Project coordinator.
THE SMALL MEASURE SPOON

A pharmacist weighted the amount of powder contained by the small measure spoon.

A flat measure spoon contains 25 mg.

A piled up measure spoon contains 400 mg.

In literature the dosis goes from

1) 100-250 mg twice per day (Hager-Rom)

2) 1-2 grams British Pharmaceutical Codex (B.P.C.)

3) 50 mg/kg, it is about 3 grams for a person of 60 kg (PUBMED)

We propose according our experience in Europe and Africa 500 mg three times a day. Raw or cooked. In sauces, soup, on cereals, vegetables, nshima, or on bread.
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Anacyclus pyrethrum

Atlas Mountains Morocco.

Local name: Tiguandizt.
SAFETY OF PYRETHRUM ROOT

*(Anacyclus pyrethrum)*

The root of *Anacyclus pyrethrum* has been used in medicine since ancient times. The properties are described in medical books of Hildegard of Bingen, Dodoens, Culpeper, but also in modern times. Scientific studies are in the PUBMED of the National Library of Medicine (NLM).

The chemical compounds are well described by Prof. F. Bohlmann and others. The toxicity is well known. Hager Rom. LD50 (Mice) is 750 mg/kg. The plant can be found in the medical dictionaries.

The herb is widely used as a spice in Germany, Austria, Switzerland, France, the Netherlands, Belgium. More specially by those who follow the natural medicine described by Hildegard of Bingen.

The herb is used in Morocco. Local name: Tiguandizt.

The daily dosage goes from 500 mg per day up to 2 gramms per day. Normal dose: one to three points of a knife. For scientific reasons we included a small measure spoon which contains 400 mg when it is piled up.

The plant is mostly known for his sialagogue effect. But has also insecticide activities and also against worms. We put forward that he protects also against malaria. A scientific study is in preparation. The efficacy against “intermittent fever” was described by Hufeland, the personal physician of Goethe.

Company Jura in Konstanz, Germany imports the dried root from Morocco and does quality control.